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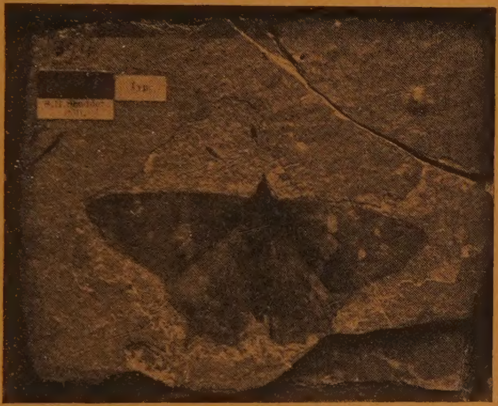

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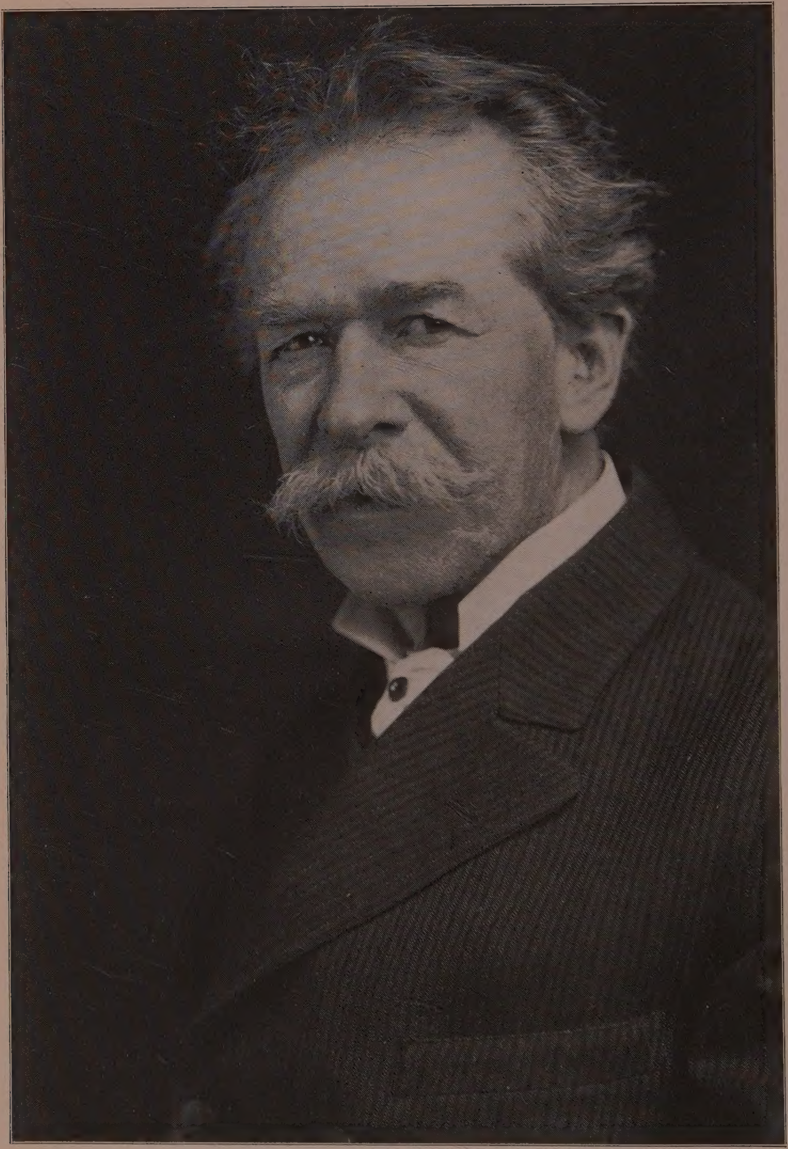

OTTO HEIDEMANN, 1843–1916

Photograph by J. H. Paine

PSYCHE

VOL. XXIII DECEMBER, 1916 No. 6

THE *VOLUCELLA BOMBYLANS* GROUP IN AMERICA.

By Charles W. Johnson,

Boston Society of Natural History, Boston, Massachusetts.

Among some Labrador Diptera received from the Museum of Comparative Zoölogy for study through the kindness of Mr. Samuel Henshaw, was a form of Volucella belonging to this interesting group. The work of identifying this form compelled me to make a study of the entire series, and the following notes are brought together in the hope of creating an interest in the study of this group in America, and possibly showing their commensal relations with the various species of genus Bombus, as has been done in Europe.

To ignore the various forms however slight without defining their limits, even though intermediates apparently exist, does not simplify matters in this case. To clearly show their differences and their resemblances to their apparent hosts—the various species of Bombus—seems to be the first step to be taken in a provisional study.

The group probably represents a protean species, of common origen, circumboreal in distribution, and representing an extremely interesting case of resemblance or "mimicry" of their hosts, the bumble-bees. If what is true of the European species is also true of the American forms, they offer a fascinating field for research.

In referring to their resemblance to various species of Bombus, Verrall in British Flies, Vol. 8, page 485, 1901, says:

"This species varies infinitely in the color of the pubescence between the two common forms which I have noticed above; these two forms are so remarkably distinct that nobody would imagine at first that they belonged to the same species, but they are now well known to occur and to pair indiscriminately. The only pair I ever took in *cop.* belonged to the two extreme forms. There can be but little doubt that the form *bombylans* mimics *Bombus lapidarius*, while the form *plumata* mimics *Bombus terrestris*. It is only natural that with such a remarkable dimorphic species pairing indiscriminately, and mimicking a genus such as *Bombus* in which there are numerous other color forms, various other color variations should frequently occur, and a vast number of these have been described as distinct species or have received varietal names.

"If it be once recognized that all the European species which are densely pilose belong to one species, concerning which I hold no possible doubt, then the synonymical list in this book will answer for itself, though I may add that I possess several specimens of the North American *V. fascialis* Will. and I cannot distinguish any structural distinction, so that I expect both *V. facialis* Will. and *V. evecta* Walker are also synonymous."

Verrall further states: "A remarkable instance of this mimicry occurs in one very common species, *V. bombylans*, which (I estimate without accurate observation) imitates *Bombus terrestris* (and its allies) for about 60 per cent., but imitates *B. lapadarius* for about 38 per cent., while the other 2 per cent. may be of almost any *Bombus* coloring."

Another interesting feature in connection with this matter is that the inquiline bee *Psithyrus rupestris* so closely resembles *Bombus lapidarius* as to be scarcely distinguishable while *P. vestialis* is banded similar to *B. terrestris*. In this country our species of *Psithyrus* closely resembles our species of *Bombus* and no species resembling *P. rupestris* is found here.

From the above we might infer that the typical *V. bombylans* is absent in America because there is no bumble-bee here like the *Bombus lapidarius* of Europe. On the other hand our forms resemble more closely the various species of *Bombus* found here than the European species do. Thus we have forms with segments three to five of the abdomen with entirely black pile, resembling *Bombus pennsylvanicus*, etc., and others with a fulvous band on the third segment resembling *Bombus ternarius*.

Regarding their habits Verrall says: "Probably all the European species of this subfamily are scavengers in the nests of large aculeate Hymenoptera, feeding on the diseased pupæ, etc., but not parasitic on the living larvæ or pupæ, so that the association is friendly and consequently not resented by the more powerful Hymenoptera; beyond this the scavengers have probably gradually mimicked their hosts in order to obtain the protection afforded by their aculeate powers. Dr. Sharp's observations on the larvæ of *V. inanis*, which live in the nests of *Vespa crabro*, tend to show that the larvæ are welcome scavengers who live on the pupæ which have recently died and who thereby prevent those dead pupæ from contaminating the nest, for which friendly action their imitative coloring may possibly indicate them as friends rather than conceal them as enemies."

Twenty-one specific names are placed in the synonomy by Verrall and twenty-four (including the American *V. evecta, sanguinea* and *facialis*) are in the synonomy under *V. bombylans* in the Katalog der paläarktischen Dipteren, 1907.

I have before me seventeen specimens of the European and Asiatic forms and forty-one specimens of the American forms. Specimens from Knight Valley, Cal. (H. Edwards), described as *fascialis* Will. cannot be separated satisfactorily from the European forms, *plumata* and *hæmorrhoidalis*. The pile on the pleura is black and the face and front yellow. A male from Alai Mountains, Turkestan, shows the same variation as a specimen from California, the lateral stripe of yellow pile being absent in front of the tranverse suture; the face, however, is black and the antennæ slightly darker in the Asiatic specimen. The color of the antennæ used by Bigot in his table (Ann. Soc. Ent., France, July, 1883, p. 79) seems to be of little value in separating the forms as there are apparently all gradations from reddish brown to brownish black. As the typical *bombylans* is not known in America it is perhaps best at present to use *fascialis* for the American form and treat all the American forms as independent of the European.

There is a form closely resembling *fascialis*, with the dorsum of the thorax black pilose and face yellow, but the pile on the pleura is yellow. It seems to be confined to the northeastern United States and Canada. Before me are specimens from Franconia, N. H. (Mrs. A. T. Slosson), Wales, Me., June 20, 1909, and Lake Aziscoos, Me., July 8, 1916 (C. A. Frost), Red Indian Lake, Newfoundland, July 20, 1906 (Owen Bryant), and Lewisport, Newfoundland, July (L. P. Gratacap). To this form I assign the name *lateralis*. Types in the Boston Society of Natural History, American Museum of Natural History and the author's collection. These two forms resemble *Bombus terrestris moderatus* and *Psithyrus ashtoni*.

Another form has the dorsum of the thorax more or less black pilose with the middle of the third segment of the abdomen reddish, with long reddish pile. As the latter character applies to *sanguinea* Will., I will adopt that name, although there is apparently a slight discrepancy in the color of the pile on the thorax. This form I have only from the Rocky Mountain region, Silver Lake, Utah, July 16; top of Las Vegas Range, 11,000 feet, end of June (T. D. A. Cockerell); top of range between Sapello and Pecos Rivers, about 11,000 feet, August (T. D. A. and W. F. Cockerell); Banff, Alberta, July 17, 1902 (Amer. Mus. Nat. Hist.). The reddish band across the abdomen suggests a resemblance to *Bombus ternarius*, *B. huntii*, *B. melanopygus*, *B. sylvicola*, etc.

Specimens, which have been referred to *V. evecta* Walker, represent two quite distinct forms, the typical *evecta* has the face black, pile on the dorsum of the thorax entirely yellow and the abdomen with a band of yellow pile at the base and another at the tip of the abdomen, pleura yellow pilose. The other form differs in having only a basal band of yellow, the remainder of the abdomen black. To this form I give the name *americana*. Types in the Boston Society of Natural History and the author's collection. It resembles a number of the more characteristic species of American *Bombus*, including *Bombus pennsylvanicus*, *B. affinis*, *B. bimaculatus*, etc., and *Psithyrus laboriosus*.

Typical specimens of *evecta* are in the collection of the Boston Society of Natural History from Franconia, N. H. (Mrs. A. T. Slosson), North Adams, Mass., June 14, and Sharon, Mass., June 13.

The form *americana* is more widely distributed. Monmouth and Orr's Island, Me.; Hanover, N. H.; North Adams, Great Barrington, Mount Tom, and Auburndale, Mass.; Delaware Water Gap and near Newark, N. J., and Folsom, Pa.

The Labrador specimens represent an interesting form and were it not for the great variation and wide distribution of the group, I would describe it as a new species without hesitancy.

As matters are, however, I prefer to consider it a form for which I propose the name *arctica*.

The male is 12 mm. in length, face black with light yellowish pile, pile on vertex dull yellow, antennæ dark brown, aristæ brown. Thorax black with black pile, except the post-alar callosities which are yellow with yellow pile, pleura black with black pile, scutellum yellow, with yellow pile. Abdomen black, the second and third segments largely yellow with only a dorsal line of black, all the pile of the abdomen yellow. Legs black, tarsi dark brown. Clouding on the wings slight.

The female is similar to the male. The pile on the front is yellowish and on the entire thorax (except the post-alar callosities) a dull yellow more or less mixed with black, when viewed from above the appearance is black. The yellow markings on the third segment are much smaller or obsolete and the pile on the entire abdomen noticeably thicker and a darker yellow. This species resembles the species of the *Bombus borealis* group.

One male and nine females. Rama "N. of three line," 1898 (J. D. Sornborger); Rama, 1898, 1899 (A. Stecker and J. D. Sornborger); Nain (J. D. Sornborger); Nain, August 18, 1908 (Owen Bryant). Holotype, allotype and six paratypes in the Museum of Comparative Zoölogy, and two paratypes in the author's collection.

ON SOME TINGIDÆ FROM NEW ENGLAND.

By H. M. Parshley,
Bussey Institution, Harvard University.

In working on the New England Tingidæ I have come across three apparently undescribed forms, which are characterized herewith. The first belongs to the genus *Dictyonota*, not hitherto represented in the American fauna, of which twenty species and one variety are recognized in the Palæarctic region. Some of the species live on the broom and furze, and the naturalization of these plants along our eastern coast may possibly account for the presence of the insect in question, although *D. tricornis* Schrank is not itself recorded as dependent on the plants mentioned.

Members of this genus are easily recognized by their thick, rugose, spinous antennæ.

Dictyonota tricornis Schrank, var. **americana** var. nov.

Head, and disc of pronotum black, nervures brown, membrane between the nervures gray. Legs and body beneath very dark brown, antennæ black. Anteocular processes spinose, slightly curved, strongly divergent, frontal spines slender, convergent, as long as the first antennal segment. Antennal segments of equal thickness, rough and setose. Pronotal hood transverse, with two or three rows of areoles dorsally, not projecting over the head. The three longitudinal pronotal carinæ uniseriate, sub-parallel, extending from the hood to the posterior edge of the angulate process of the pronotum. Disc of pronotum punctate, transversely convex, narrowed anteriorly, lateral expansions with three to four rows of areoles, not produced anteriorly beyond the eyes, somewhat reflexed, concave above. Hemielytra without discal elevations, the costal vein depressed, those bounding the discoidal area sharply raised; costal area as wide as the discoidal, with two slightly irregular rows of areoles; subcostal area with two rows anteriorly, one posteriorly; discoidal area extending nearly to apex of abdomen, with three slightly irregular rows of areoles, its inner border curved. Pleuræ and bucculæ reticulate, the latter open anteriorly and evenly rounded posteriorly; sternal ridges but slightly elevated; rostrum extending a little beyond the metasternum. Orifices absent. Ventral abdominal segments each with an anterior finely shagreened area, behind which are a few curved striæ connecting the posterior angles. Males with two strong copulatory hooks at apex of abdomen. Form oval. Length 3 mm.; width 1.2 mm.

Holotype ♂, Eastport, Me., 15 July, 1909 (C. W. Johnson), in my collection; paratypes, 2 ♂♂, Machias, Me., 26 July, 1906 (C. W. Johnson); Roque Bluff, Me., 15 July, 1907 (J. A. Cushman), in the collection of the Boston Society of Natural History.

This form differs from typical *tricornis* (*crassicornis* Fall.) as follows: in shape it is a little more elongate; the lateral expansions of the thorax are a little wider; the anteocular spines are more divergent; the hood is a little more elevated; the costal area is biseriate at middle; and the bucculæ are evenly rounded posteriorly, in *triçornis* somewhat angulate. As all these characters are somewhat variable, the form may be considered a variety rather than a distinct species. My thanks are due to Mr. O. Heidemann, for his kindness in examining a specimen and pointing out some of the distinctive characters of the form. As the genus is new to the American fauna, I have included generic and specific characters in the description.

Physatocheila plexa Say, not Osb. & Drk.

Long-winged form.—Uniform dull yellowish brown, eyes and fourth segment of antennæ darker. Head with five adpressed spines arranged as follows: two anterior close together and converging, extending forward between the first antennal segments, one median arising behind and extending forward between the anterior spines, and two lateral, arising beneath the margin of the pronotum and extending forward close to the eyes beyond the base of the median spine; anteocular processes stout, incurved; first antennal segment a little longer than the second, both of these but slightly longer than broad, fourth fusiform, nearly as long as the first and second together, third somewhat longer than the front tibiæ, more slender than the others; rostrum moderate and slightly variable in length, extending more or less beyond the middle coxæ, but not beyond the posterior. Disc of pronotum strongly convex, with three low uniseriate carinæ and broad lateral expansions as in the related species; hood a little lower than in *brevirostris* but higher than in *variegata*. Costal area of hemielytra with two almost regular series of areoles; subcostal area with three rows at middle, narrowing to one posteriorly; discoidal area almost straight exteriorly, extending beyond the middle of the hemielytra; hemielytra extending considerably beyond the apex of the abdomen, apical areoles enlarged. Bucculæ large; rostral channel low, widened posteriorly, open behind; tips of wings visible beyond genital segment. Narrow elongate oval. Length ♂ ♀, 3.1–3.2 mm., width 1.1 mm.

Short-winged form.—Disc of pronotum but slightly convex; hemielytra extending but little beyond apex of abdomen, the areas all present but somewhat shortened; wings, if present, not visible beyond genital segment. Broadly oval. Length 3 mm., width 1.1 mm.

Redescribed from specimens taken at Kingston and Providence, R. I., and Truro, N. S.

That this is the form on which Say based his description of *Tingis plexus* (Compl. Writ., Vol. 1, pp. 349–350) is perfectly evident from these quotations: ". . . brownish, more or less tinged with yellow," and ". . . two series [of reticulations] . . . on the lateral margins . . . [of the hemielytra]," statements which apply particularly to this insect, while there is nothing inapplicable in the rest of the description. The characters of *P. variegata* sp. nov. (=*P. plexa* Osborn and Drake, not Say, Ohio Biol. Surv., Vol. 2, 1916, p. 242) are distinctly at variance with Say's description, especially the color, and the reticulation of the costal area. Moreover, if this species had been before him, it is extremely probable that he would have noted the unusual length of the rostrum, as he did in the case of other small Hemiptera.

Physatocheila variegata sp. nov.

(*P. plexa* Osb. & Drk., not Say)

Long-winged form.—Brown, variegated with black and pale cinereous, eyes and fourth antennal segment darker; spines of head pale; disc, reflexed expanded margins, and angulate process of pronotum more or less marked with black, longitudinal carinæ more or less pale on the ends, this feature persisting especially at the posterior ends of the lateral carinæ, and anterior end of the median; costal area of hemielytra with some of the veinlets black, subcostal and discoidal areas pale cinereous at base and apex, the intervening veinlets more or less blackened; legs brown, femora paler at apex; body beneath cinereous brown. Rostrum unusually long, extending beyond the base of the second abdominal segment. Costal area of hemielytra with areoles irregularly arranged in confused rows, averaging three areoles in width. Other characters about as in the preceding. Form rather broad oval. Length 3.4–4 mm., width 1.3–1.5 mm.

Holotype ♂ and allotype, Gowanda, N. Y., 22 August, 1909 (E. P. Van Duzee); paratypes, Gowanda, N. Y., 21 August, 1898 (E. P. V. D.); Salamanca, N. Y., 20 July, 1911 (E. P. V. D.); Berkeley Springs, W. Va., 26 July, 1888; Wellesley, Mass., 19 May, 1891 (A. P. Morse); Portland, Conn., on white pine, 15 May, 1914 (B. H. Walden). Types in collections of Van Duzee, Parshley, Ohio State University, and Boston Society of Natural History.

This species varies in distinctness of markings but never approaches the uniform yellowish brown of the true *plexa* Say, from which it is further distinguished by its longer rostrum and irregularly triseriate costal area. In *P. brevirostris* Osb. & Drk., the rostrum does not extend beyond the middle coxæ, the color is uniform dull brown, and the costal area is regularly triseriate.

Some time ago Mr. C. J. Drake kindly sent me a specimen of this species, determined as *P. plexa* Say, and recently Mr. Van Duzee, learning that I had a new *Physatocheila* under consideration, most generously submitted specimens known to him to be of a new species, which have been of great assistance to me in working out the true status of these forms.

Melanorhopala obscura sp. nov.

Long-winged form.—Dark yellowish brown, tinged with gray, eyes, tips of antennæ, rostrum, and tarsi darker. Head with five long acute spines, three arising from the vertex and extending freely forward between the antennæ, two adpressed, arising from the base of the head and extending forward near the eyes. Antennæ proportionally about as long as in *clavata*, but less distinctly club-shaped, the third segment being only slightly more slender than the fourth and but little, though distinctly, enlarged at apex; fourth about as long as the first, regularly fusiform; the second shorter than the first, very slightly enlarged apically. Pronotum convex, with three longitudinal carinæ and uniseriate lateral expansions which are vertically reflexed. Costal area of hemielytra uniseriate, subcostal biseriate, discoidal not quite reaching middle of hemielytra; costal margins parallel, slightly sinuate near middle. Length 4.8 mm.

Short-winged form.—Pronotum narrower, disc perfectly flat, hemielytra narrowed apically, the costal margins evenly curved. Length about 4.5 mm.

Holotype, long-winged ♂, Beach Bluff, Mass., 21 June, 1915 (Parshley), taken in ocean beach drift; paratype, short-winged ♂, Nahant, Mass., 16 July, 1915 (Parshley), with apices of hemielytra somewhat injured; both in my collection.

Sufficiently distinct from the other species of *Melanorhopala* by reason of its small size, narrow form, and antennal structure. In

M. clavata Stal the third antennal segment is more slender, the fourth conical, in the long-winged form the costal margins are distinctly curved, not parallel, and the discoidal area extends slightly beyond the middle of the hemielytra; in *M. lurida* Stal the third and fourth antennal segments are longer, scarcely clavate; and in *M. uniformis* Stal the antennæ are much shorter.

QUESTIONS OF NOMENCLATURE CONNECTED WITH THE ANT GENUS LASIUS AND ITS SUBGENERA.

By William Morton Wheeler,
Bussey Institution, Harvard University.

There seems to be no end to the nomenclatorial cataclysms precipitated by men who delight in resuscitating and reëditing musty entomological documents that have been unfortunately spared by the tooth of time to plague those among us who wish to see taxonomy rapidly stabilized so that we may be able to give all our attention to more interesting and important matters. Just as we were beginning to flatter ourselves that a few common insect names in universal use for the greater part of a century must at last be immune from the inroads of the resuscitators we are informed by Morice and Durrant[1] that our familiar generic name *Lasius*, which has been borne so long by the common garden ant, probably the most abundant insect of the northern hemisphere, must be consigned to the synonymic limbo and replaced by a new name. The case is so clearly stated by Donisthorpe in his excellent monograph of British ants[2] that I shall quote his account of it. "Fabricius (Syst. Piez., 415, 1804) published a heterotypical genus *Lasius* for the reception of ten species of ants, but this use of the name is invalid since *Lasius* (Type *Apis quadrimaculata* Panz.) had already been used by Jurine for a genus of bees [Erlangen Litteraturzeitg., 1, 164, No. 33, 1801: Nouv. Méth. Hym., 235–238, No. 33, Pf. 4, 33, 11.33. 1807]. Latreille, Gen. Crust.

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[1] The authorship and first publication of the "Jurinean" Genera of Hymenoptera: being a reprint of a long-lost work of Panzer, with a translation into English, and Introduction and Bibliographical and Critical Notes. Trans. Ent. Soc., London, 1914 (1915), pp. 339–436.

[2] British Ants, Their Life History and Classification. Plymouth, Wm. Brendon and Son, Ltd., 1915, p. 186.

Ins. 4.126 (1809) sunk *Lasius* F. as a synonym of *Formica,* and the Fabrician name ceased to be used till 1861, when Mayr (Europ. Formicid., 49, 1861) revived and recharacterized *Lasius* F., adopting *niger* L. as his type. Bingham Faun. Brit. India. Hym. 2, 338 (1903) and Wheeler Ann. New York Acad. Sc., 21, 165 (1911), also cite *niger* as the type. This species was also adopted as the type by Morice and Durrant Trans. Ent. Soc., London, 1914, 9, 421–423 (1915), who gave the following reasons for the change of the name: "In the Systema Piezatorum Fabricius made use of Jurine's name *Lasius* but applied it to a genus of ants which he separated from *Formica* L. and later authors have ignored Jurine's *Lasius,* no doubt because the publication of the Piezatorum (1804) antedates that of the Nouvelle Méthode (1807). But the real date of *Lasius* Jrn. as we now learn, is May 30, 1801 (Erlangen list), § *Lasius* F. (1804) therefore sinks as a homonym of the earlier *Lasius* Jrn. A new name for *Lasius* F. is necessary; there being apparently no existing synonym, we therefore propose that it be called *Donisthorpea* in recognition of Mr. H. St. J. K. Donisthorpe's careful investigations into the bionomics of this and other Heterogynous genera."

A study of Morice and Durrant shows that the article which they unearthed in the Erlangen Litteraturzeitung of 1801 was published anonymously, but that in a footnote to page 7 of the Kritische Revue of 1806 Panzer admitted that he was its author. It is clear, furthermore, that Panzer cited *Lasius* and several other Hymenopterous genera as Jurine's. My friend Professor Cockerell writes me that he regards the Panzer article as having no taxonomic status both because it was published anonymously and because it did not appear in a scientific journal. I incline to agree with him, though I am compelled to admit that the publication of the genera as Jurine's and not as those of the anonymous author may put a different construction on the matter. This evidently determined Morice and Durrant to accept *Lasius* and certain other genera as being valid and as antedating those of Fabricius. So far as I am able to learn, cases of this kind are not specifically provided for in our various nomenclatorial codes.

Accepting for the moment the correctness of Morice and Durrant contention that *Lasius* Jurine must supplant *Anthophora* among the bees and that the genus *Lasius* Fabr. must be renamed, we may next inquire whether the introduction of the name *Donisthorpea* was justified. Little study of the history of the ant genus *Lasius* is needed to establish the fact that there are at least *three* other names, each of which would take precedence of the one suggested by the authors under consideration. In 1840 Shuckard[1] gave the name *Formicina* to a genus, which according to his statement contained what we now call *Formica rufa* and *Lasius flavus*, so that if no resuscitator succeeds in exhuming some other name suggested between 1807 and 1840, *Formicina* should be chosen to replace *Lasius* Fabr., with *L. flavus* as the type. Shuckard evidently selected the large *Formica herculeana* L. as the type of his genus *Formica* (our present *Camponotus*) and placed the smaller species, which we now assign to *Formica* and *Lasius*, in his genus *Formicina*. A second name *Acanthomyops*, was proposed by Mayr in 1862[2] for the North American *Lasius claviger* Roger. This name has since been retained as that of a subgenus characterized by three-jointed instead of six-jointed maxillary palpi in the worker and female. Ruzsky,[3] in 1913, recognized two additional subgenera: *Dendrolasius* and *Chthonolasius*, the type of the former being *L. fuliginosus* Latr.; that of the latter, *L. flavus* L. *Chthonolasius*, therefore, falls as a synonym of *Formicina* Shuckard, but even *Dendrolasius* would take precedence of *Donisthorpea*. If, however, *Formicina* takes the place of *Lasius* as a generic name, the genotype must be shifted to *L. flavus*, a species belonging to what is now a different subgenus, so that *Donisthorpea* could be retained as the name of a subgenus with *L. niger* as the type. The genus would then have the following composition:

Genus *Formicina* Shuckard (=*Lasius* Fabr.).
    Genotype: *Formica flava* L.
Subgenus *Formicina* Shuckard (=*Chthonolasius* Ruzsky).
    Subgenotype: same as the genotype.
Subgenus *Donisthorpea* Morice and Durrant (=*Lasius auct*).
    Subgenotype: *Formica nigra* L.
Subgenus *Dendrolasius* Ruzsky.
    Subgenotype: *Formica fuliginosa* Latreille.

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[1] In Swainson and Shuckard's "On the History and Natural Arrangements of Insects," Longman, Orme, etc., London, 1840.

[2] Verh. zool. bot. Ges. Wien, 12, 1862, p. 699.

[3] Myrmekologische Notizen. Arch. f. Naturg., 79, 1913, pp. 58–63, 3 figs.

Subgenus *Acanthomyops* Mayr.
Subgenotype: *Lasius claviger* Roger.

While discussing Morice and Durrant's work in a recent paper[1] Forel contends that *Acanthomyops* Mayr. should replace *Lasius* Fabr. He therefore cites the genus and its subgenera thus:

"Genre *Acanthomyops* Mayr. (1862).
=*Lasius* F. 1804 (*non* Jurine 1801).
=*Donisthorpea* Morice et Durrant.
Type: *claviger* Roger.
Subgen.: *Chthonolasius* Ruzsky.
Type: *niger* L. (*flavus* ex Ruzsky).
Subgen.: *Dendrolasius* Ruzsky.
Type: *fuliginosus* Latr."

This arrangement seems to me to be inadmissible, first, because Forel has no right to change the type of the subgenus *Chthonolasius* from L. *flavus* to L. *niger*, and second, because these two forms, in my opinion, represent distinct subgenera, *Chthonolasius* (=*Formicina*) being sufficiently characterized by the shape of the maxillary palpi of the female and worker, the vestigial eyes of the worker and the hypogæic mode of life. In the two latter characters the species of *Chthonolasius* resemble those of *Acanthomyops* and not *niger* and its allies. As an after-thought, however, Forel appends the following postscript: "Mr. Emery m'écrit qu'à son avis il vaudrait mieux prendre pour *Lasius* le nom nouvellement deterré par Wheeler de *Formicina* Shuck., nom en partie basé sur le *Lasius flavus*. Je n'ai rien à y opposer, pourvu qu'on finisse une bonne fois avec ces déménagements perpétuels des anciens noms." I infer, therefore, that he now favors an arrangement like that given above (p. 170) with *Formicina*as the genus, but with *Donisthorpea* eliminated and its species included in the subgenus *Formicina*.

For the present I propose to be conservative and to retain *Lasius* Fabr., because the status of Panzer's Erlangen list seems to me to be very dubious and because I sympathize with those entomologists who decline to abolish generic names in universal use for more than half a century. I therefore suggest the following as a satisfactory arrangement of our North American forms of *Lasius*:[1]

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[1] Fourmis du Cogo et d'autres provenances récoltées par M M. Hermann Kohl, Luja, Mayne, etc. Rev. Suisse Zool. 24, 1916. p. 460.

Genus *Lasius* Fabr.

Subgenus *Lasius* Fabr. (=*Donisthorpea* Morice and Durrant)

niger L. var. *sitkaënsis* Pergande.
    Var. *neoniger* Emery.
    Subsp. *alienus* Forster var. *americanus* Emery.

Subgenus *Formicina* Shuckard (=*Chthonolasius* Ruzsky).

flavus L., subsp. *nearcticus* Wheeler.
    Subsp. *claripennis* Wheeler (in MS.).
brevicornis Emery.
    Subsp. *microps* Wheeler (in MS.).
umbratus Nylander subsp. *subumbratus* Viereck.
    Subsp. *mixtus* Nyl. var. *aphidicola* Walsh.
    Subsp. *vestitus* Wheeler.
    Subsp. *speculiventris* Emery.
    Subsp. *minutus* Emery.
humilis Wheeler (in MS.)

Subgenus Acanthomyops Mayr.

claviger Roger.
    Subsp. *subglaber* Emery.
interjectus Mayr.
    Subsp. *mexicanus* Wheeler.
    Subsp. *coloradensis* Wheeler (in MS.).
    Subsp. *arizonicus* Wheeler (in MS.).
    Subsp. *californicus* Wheeler (in MS.).
occidentalis Wheeler.
murphyi Forel.
latipes Walsh.

POSTSCRIPT.

Since the preceding article was sent to the Editor of PSYCHE, I have received from Professor Emery a paper (Formiche d'Italia nuove o critiche. Rend. R. Accad. Sc. Ist. Bologna 12 Marzo,

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[1] The subgenus *Dendrolasius*, which should include besides the subgenotype L. *fuliginosus*, the peculiar Japanese L. *spathepus* Wheeler, is confined to Eurasia and is therefore omitted.

1916, pp. 53–66, 7 figs.) in which he discusses the synonymy of *Lasius* and its subgenera. He accepts Jurine's *Lasius* as valid and substitutes *Formicina* Shuckard for *Lasius* Fabricius, presenting the same arrangement of the subgenera and their types as I have given on page 170. I am still unable to take this view of the matter, because I am not convinced that the generic name of another author (in this case Jurine) is valid when cited in an anonymous paper which itself has no taxonomic status. It would seem that if an anonymous author later acknowledges the authorship of his paper, the validity of the latter should date only from the time of this acknowledgment. If this rule were followed, *Lasius* Jurine would date from 1806 and could not replace *Lasius* Fabricius of 1804.

A PHOSPHORESCENT ANT.

By William Morton Wheeler,
Bussey Institution, Harvard University.

Mr. George P. Engelhardt, curator of the Division of Invertebrates of the Brooklyn Museum, recently sent me the following letter and the ant to which it refers:

"San Francisco, Calif., Aug. 8, 1916.

"*My dear Prof. Wheeler:*

"One of my most interesting days on the Pacific Coast this summer was spent with Fordyce Grinnell on a thirty-mile tramp through the Sierra Madre, July 28. Starting from Pasadena we followed the Arroyo Seco to the Divide, came up around Mount Gabriel (6,150 feet) and reached Mount Lowe (5,650 feet) in time for a glorious sunset. Our descent from Mount Lowe was made over the steep and winding ridge trail after dark. There was no moon, but a star-studded sky, while 5,000 feet below Pasadena and Los Angeles had been transformed into a sea of sparkling lights.

"Down at about the 4,000 feet level we stopped before a bright spark rapidly crossing the trail. Expecting to find one of the Lampyrids, or fireflies, which Grinnell told me were uncommon in the region, we struck a match and to our surprise found an ant. Neither of us had heard of phosphorescent ants before. In a cyanide tube the phosphorescence of the ant remained undiminished for fully five minutes, after which it decreased gradually and in fifteen minutes disappeared. The light issued ventrally from the last two or perhaps three abdominal segments. It was greenish yellow, and very much like that of our common eastern firefly, only it was constant, not intermittent

"We kept a sharp look-out all the way down the trail, but no other specimens were found.

"Very sincerely yours,
"Geo. P. Engelhardt."

The ant proves to be a worker media of *Camponotus maculatus* Fabr., subsp. *vicinus* Mayr., var. *semitestaceus* Emery, a form peculiar to higher elevations in the Californian Coast Range. It is the palest of several varieties of *vicinus*, which ranges as far east as Colorado and Montana and as far south as Arizona and New Mexico. The yellow color of the var. *semitestaceus* shows that it is nocturnal, but my observations lead me to suspect that the darker forms of *vicinus* have the same habit. As no ants are known to possess photogenetic organs, and as *C. maculatus* is of world-wide distribution and represented by many yellow subspecies and varieties especially in North Africa and Asia Minor, where any tendency to phosphorescence would certainly have been seen and noted, I conclude that the specimen taken by Mr. Engelhardt must either have just fed on some phosphorescent organism or have been infected with phosphorescent bacteria. Although Dr. Rudolph Glaser went to some pains to section and stain the hard abdomen of the specimen for me, I was unable to detect any structures that might account for the luminescence. This failure was in great part due, in all probability, to the imperfect preservation of the ant, which had merely been dropped into strong alcohol. The problem of the source of the greenish yellow light emitted by the posterior abdominal segments and witnessed by Messrs. Engelhardt and Grinnell will, therefore, require fresh material for its solution and must be referred to some entomologist residing in California.

A NEW SPECIES OF APHIOCHÆTA (DIPTERA, PHORIDÆ) FROM NEW ENGLAND.

By Charles T. Brues,
Bussey Institution, Harvard University.

Aphiochæta johnsoni sp. nov.

Length, 2.0 mm. Fore tarsi thickened; mesopleura bristly above, without any macrochæta, two scutellar bristles. Thorax brownish yellow; head black; abdomen black or piceous, the first three segments narrowly margined with whitish; hypopygium fuscous, its lamella yellow; legs luteous or dull yellow. Front slightly broader than high; ocellar tubercle large, median frontal groove present, proclinate bristles four, the lower pair much more delicate than the upper pair and almost as far apart; inner bristle of lower reclinate row on the anterior margin of the front midway between the upper proclinate one and the eye-margin, outer bristle close to the eye-margin and well above the margin of the front; middle row of four equidistant bristles forming a row that is bent down medially. Antennæ not enlarged, dark fuscous, arista as long as the head height, strongly pubescent. Palpi distinctly enlarged, but less so than in *A. projecta,* with several short bristles below and a pair at tip almost as long as the vertical thickness of the palpus; cheeks each with two strong bristles; postocular cilia strong. Propleura above the coxa with stout bristles and with weaker ones on its upper half. Mesonotum subshining, hairy, with a number of bristles along the sides and posterior edge; scutellum with two bristles and two hairs; mesopleura above with a patch of small bristles of equal size. Abdomen opaque, with scattered bristly hairs, especially conspicuous near the sides of the basal segments and on the disc of the fourth and following segments. Hypopygium and its median lamella also bristly. Legs stout; anterior tarsi thickened, longer than their tibiæ; middle tibiæ with very weak cilia; those of hind tibiæ a trifle stronger, but not conspicuous; hind tibiæ with four short transverse rows of minute bristles inwardly at tip; hind tibiæ not ciliate below, with only the usual short hairs. Wings large, distinctly tinged with brownish; costal vein extending to distinctly beyond the middle of the wing; costal cilia short and closely placed; first section of costa slightly more than twice as long as the second; third three-fourths as long as the second; second vein ascending rather sharply to the costa; fourth vein curved at the base, but nearly straight beyond, fifth and sixth sinuous; seventh distinct, long. Halteres pale yellow.

One specimen from Kent, Me., August 19, collected by Mr. C. W. Johnson. Type in the collection of the Boston Society of Natural History.

This species is related to *projecta* Becker which also occurs generally through New England (Boston, Mass.; Brookline, Mass.; Hanover, N. H.), but differs by having the lower pair of proclinate bristles weaker and the palpi less noticeably enlarged in the male as well as by the absence of a fringe of hairs on the posterior femora and the presence of only two scutellar bristles. It is also much like the European *A. hortensis* Wood, but the hypopygium is bristly.

THE PANURGINE BEES OF THE GENERA HESPERAPIS, ZACESTA AND PANURGOMIA.

By T. D. A. Cockerell,
University of Colorado, Boulder, Colorado.

The genus *Hesperapis* Ckll., 1898, was based on *H. elegantula* Ckll. from New Mexico. At the present time seven species are assigned to it, the range of the genus being from New Mexico to Southern California. The following table separates the known forms:

Thorax above with moss-like ochraceous hair; abdomen dull ferruginous . . . . *elegantula* Ckll.
Thorax with ordinary pubescence; abdomen not red 1
1. Area of metathorax dull, or only the apical part shining 2
  Area of metathorax polished and shining 3
2. Mesothorax strongly and closely punctured, somewhat shining; male about 11.5 mm. long . . . . *eumorpha* (Ckll.)
  Mesothorax and scutellum shining, polished, finely punctured; male a little over 6 mm. long . . . . *nitidula* Ckll.
  Mesothorax and scutellum dull, not evidently punctured *semirudis* Ckll.

3. Wings perfectly clear . . . . *larreæ* Ckll.
Wings brownish 4
4. Wings milky at apex; legs of male wholly black . . . . . *oliviæ* Ckll.
Wings not milky at apex; male tarsi variably reddish
rhodocerata Ckll.

The description of ♀ *rhodocerata*, as originally given (*Panurgus rhodoceratus*, Trans. Am. Ent. Soc., XXIV, p. 148), included the ♀ of *H. oliviæ*, which is separable with difficulty. The males are more distinct and the ♂ *rhodocerata* may be regarded as the type. Both species visit the flowers of *Pectis* in September.

Zacesta Ashmead, 1899, was described as a member of the Osmiinæ, but Titus (Jn. N. Y. Ent. Soc., XII, p. 26) showed that it was a Panurgid. It comes from Los Angeles County, Cal., and is known only in the male. Examining the type of *Z. rufipes* Ashm. in the U. S. National Museum, I found that it closely resembled *Hesperapis* as typified by *H. elegantula*. The following characters are noteworthy:

(1) The moss-like ochraceous hair on thorax above, as in typical *Hesperapis*.
(2) The narrow face and essentially parallel orbits, as in *H. elegantula*.
(3) The orange flagellum, as in *H. elegantula*, but the scape shorter and stouter (sexual character?).
(4) Clypeus has a broad yellow apical band, not seen in *Hesperapis* (but male of *H. elegantula* is unknown).
(5) Compared with *H. elegantula* has larger, shining, area at base of metathorax.
(6) Venation is as in *H. elegantula*, except that second submarginal cell is longer, and the lower section of basal nervure descends much less abruptly.
(7) The pygidial plate is long and narrow.
(8) Titus has described the palpi of *Zacesta;* the first three joints of labial palpi are nearly equal whereas in *H. elegantula* the first is nearly as long as 3 plus 4, the second somewhat shorter than the first.

Hesperapis, as interpreted above consists of at least two very distinct groups, one typified by *H. elegantula* (type of genus), and the other containing the remaining species. *Zacesta* is perhaps closer to *H. elegantula* than it is to the other species assigned to *Hesperapis*, and its rank as a genus appears doubtful. I think we must call it *Hesperapis* (*Zacesta*) *rufipes* (Ashm.).

Panurgomia Viereck, 1909, was based on *P. fuchsi* Viereck, from Arizona. The unique specimen, a female, was unfortunately in bad condition. Mr. J. C. Crawford recently wrote me (February, 1916) that he considered the genus identical with *Hesperapis*, and the type species at least extremely close to *H. eumorpha* Ckll. This led me to reëxamine the type, and I found that it possessed the essential characters, so far as could be seen, of the group of *Hesperapis* which includes the majority of the species. The entirely dull area of metathorax agrees with the minor group of *H. eumorpha*, etc. The stigma is too large for typical *Hesperapis*. The clypeus is large, strongly convex, polished and shining. Hence it appears that *Panurgomia* is a valid subgenus (or genus?) for the group of *Hesperapis* which excludes the typical species.

A NEW ENGLAND ORTHOPTERAN ADVENTIVE.

By Albert P. Morse,
Wellesley College, Wellesley, Massachusetts.

Hapithus vagus sp. nov.

A large and rather stout member of the genus. Rostrum of the vertex as broad as the basal joint of the antennæ. Antennæ, except the basal joint, long and extremely slender, two or three times as long as the body, pale brown, annulate with dusky on alternate joints, every third annulus darker; this pattern is very noticeable near the base and becomes indistinct apically. Maxillary palpi with last joint slender at base, a little securiform, twice as long as the width of the broadened tip.

Pronotum transverse, narrowed anteriorly, the front margin straight or slightly concave, the hind margin a little convex medially; lateral lobes twice as long as deep, smoothly convex below, the anterior and posterior angles rounded. Tegmina nearly or quite covering the abdomen, those of male flat above; of female a little convex, with densely and irregularly reticulate venation, the lateral field crossed by about seven parallel oblique branches of the mediastinal vein. Wings as long as tegmina. Hind femora plump, stout, a little less than three times as long as broad. Hind tibiæ armed with four spines on outer side, usually five (sometimes six) on inner side, with numerous short rigid teeth between them. Ovipositor slightly shorter than the hind femora, straight or gently curved upward at base, the tip armed at base with a prominent, dull tooth which is succeeded by a diminishing series of four or five smaller ones toward the apex. Cerci short, less than one-third as long as ovipositor, tapering acuminately from a stout base to a delicate point and clothed with long, soft pubescence.

The ground color is a pale yellowish brown thickly and irregularly spotted and in places washed with darker brown and fuscous, particularly in an hour-glass or X-shaped mark on the middle of the pronotum above, the entire area of the lateral lobes, the dorsal part of the lateral field of the tegmina, and the outer face of the hind femora. The dorsal field of the tegmina of the female often shows a series of three or four oblique dusky lines running backward and inward from the canthus along irregular raised venules; in the male a variable number of irregular fuscous spots is distributed chiefly along the canthus and about the speculum, with a larger stigmatal blotch.

MEASUREMENTS.

Body.	Hind fem.		Tegmina.	Antenna.	Cercus.	Ovipositor.
	Length.	Width.				
♂ 13–15 mm.	10	3.5–4	9.5–10	40–45	2.5	
♀ 14–15 mm.	10–12	3.5–4.5	9.5–10	40–45	2.5	8.5–9 mm.

Described from the type (♀), allotype (♂), and several paratypes of both sexes; the material also contains several nymphs in various stages. Collection of A. P. Morse.

This species was first recorded by Scudder (PSYCHE, September, 1900, 105) under the name *Apithes agitator*, from the greenhouse of the Botanic Garden at Cambridge, Mass. The specimens on which the description is based were collected there in alcohol in September and October, 1902. Recently, on pinning them up, it was seen to be quite distinct from *agitator*. Mr. Morgan Hebard has kindly examined a pair and compared descriptions and regards it as new.

I am informed by Mr. Cameron of the Botanic Garden that these insects were troublesome in the greenhouse for five or six years, eating the tender green leaves of many kinds of plants and seeming to be particularly fond of ferns; also, that they were believed to have come originally from Jamaica. Their extermination is believed to have been effected at least in part through the introduction into the greenhouse of a number of small frogs.

ANTS CARRIED IN A FLOATING LOG FROM THE BRAZILIAN MAINLAND TO SAN SEBASTIAN ISLAND.

By William Morton Wheeler,
Bussey Institution, Harvard University.

Dr. Hermann von Ihering, the well-known writer on zoögeography and till recently the director of the Museu Paulista of San Paulo, Brazil, has sent me for identification some ants which were taken under the peculiar circumstances described in the following paragraph quoted from his letter:

"I find that the 'raft-theory' of dispersal has generalized some exact observations in an extraordinary manner. Here in South America we have wonderful opportunities to observe the 'swimming islands' in the great rivers, although the upper and lower courses of these streams have to a considerable extent their own peculiar faunas. My experiments with wood, bamboo, etc., containing ant-colonies, have demonstrated that the latter are decidedly resistant to submersion provided their nest-entrances are closed. Till the current year, one of our naturalists, Mr. Gaste, was, however, unsuccessful in his various excursions in finding living insects in wood that had drifted from our coast. One morning, while he was on the island of San Sebastian, he found a tree trunk that had floated to the shore during the night and was filled with a living ant-colony belonging to a species of *Pheidole* unknown to me. San Sebastian is situated some kilometers off the coast of the main land. Of course, we cannot say how long this log had been floating in the water before it reached the island. Please examine the ants," etc.

The portion of the ant-colony received from Dr. von Ihering consists of a single soldier, five workers and three young, winged females, representing a new species of *Pheidole* of which I subjoin a description.

Pheidole peregrina sp. nov.

Soldier: Length, 3.2 mm. Allied to *Ph. pubiventris* Mayr, *rufipilis* Forel, and *angusta* Forel, especially to the last. Head small, subrectangular, a little longer than broad, as broad in front as behind, with rather straight sides and feebly excised posterior margin. Eyes moderately large and convex, in front of the middle of the sides of the head. Mandibles rather large, indistinctly denticulate in the middle, with two large apical and two small basal teeth. Clypeus with a short carina behind, concave in front, with rather deeply notched anterior border. Frontal area distinct, triangular, not deeply impressed, with median carinula. Frontal carinæ short. Antennal scapes rather stout but not flattened, curved at their bases, their tips reaching a little more than half the distance between the eyes and the posterior corners of the head. Joints 2–7 of the funiculus scarcely longer than broad, club a little longer than the remainder of the funiculus, its two basal joints subequal, together as long as the terminal joint. Thorax shaped much as in *pubiventris*, but the pronotum without prominent humeral tubercles and the epinotal spines reduced to small, erect teeth which are not longer than broad at their bases. Petiolar node compressed anteroposteriorly, with indistinctly emarginate, transverse superior border. Postpetiole less than twice as broad as the petiole, with rounded sides and dorsal surface. Gaster elongate elliptical, with distinctly truncated anterior border. Legs moderately long.

Smooth and shining: mandibles coarsely and sparsely punctate; cheeks and front rather loosely longitudinally rugose; remainder of head with sparse, fine, piligerous punctures. Mesonotum, epinotum and sides of petiole opaque, very finely and obscurely punctate-rugulose.

Hairs short, abundant, pale yellow, reclinate, covering the whole body and the appendages, longest on the gaster, which, however, has no appressed hairs. Pubescence absent.

Brownish yellow, legs a little paler, clypeus and posterior portion of gaster somewhat darker; antennal clubs blackish.

Worker: Length, 2 mm. Head distinctly longer than broad, narrower behind than in front, without posterior corners but with distinct, reflected occipital margin. Eyes in front of the middle of the sides. Mandibles finely denticulate, with two larger apical teeth. Anterior clypeal border straight, transverse and entire in the middle. Antennal scapes extending about one-fourth their length beyond the occipital border of the head. Thorax, petiole, postpetiole and gaster much as in the soldier, but epinotal teeth more slender and pointed and a little longer than broad at their bases.

Sculpture and pilosity as in the soldier but the hairs are somewhat more erect.

Brownish yellow, mandibles paler, head, clypeus and terminal antennal joint castaneous. In some specimens the middle portions of the femora and tibiæ are very feebly infuscated.

Female: Length, 5–5.5 mm. Head distinctly broader than long, a little broader behind than in front, with straight sides and feebly excavated posterior border. Mandibles finely denticulate, with two large apical teeth. Clypeus as in the soldier. Antennal scapes reaching to the posterior corners of the head. Thorax of the usual shape, with strongly flattened mesonotum; epinotum with acute teeth as long as broad at their bases. Petiolar node rather low, its upper border sharp and entire.

Sculpture, pilosity and color much as in the soldier, but the head indistinctly rugulose and coarsely punctate over its whole dorsal surface, the mesonotum more densely punctate and behind on the middle finely and densely striolate, the postpetiole opaque and finely punctate and the gaster brown, except at the base. Ocellar region black. Wings yellowish hyaline, with pale yellow veins and pterostigma.

This species differs from *pubiventris*, *rufipilis* and *angusta* in its smaller size, in pilosity and in the head of the soldier being even smaller than in *angusta*. The hairs of *peregrina* are more reclinate, more abundant and shorter than in any of these species, the epinotal spines are less developed, the pronotum is smooth and rounded, without tubercular humeri in the soldier and the head of the worker is longer and has a reflected occipital margin which is lacking in *pubiventris* and *angusta*.

The observations of Mr. Gaste and Dr. von Ihering throw light on one of the methods of ant dispersal. Of course, the establishment of a species of ant on an island does not require the conveyance of a whole colony as in this instance, since a single fecundated female enclosed in a vegetable cavity might, if transported in a similar manner, suffice for the establishment of a species.

ON THE TYMPANUM OF CERTAIN LEPIDOPTERA.

By William T. M. Forbes,
Ithaca, N. Y.

At the base of the abdomen in many Lepidoptera there is a curious and complex organ, which has been referred to but rarely in the literature, and which is known, in the Geometridæ, at least, as the tympanum. So far as I have discovered, its function is unknown, but its location and general structure justify the guess that it is the resonator for an auditory organ, corresponding to the well-known one in the Hemiptera. It should prove an interesting problem for the histologist and physiologist. The present article will not consider its function, but will outline its structure in the principal families of Macrolepidoptera, and offer a couple of suggestions as to their relationship.

A brief examination shows that there are several analogous, but not homologous organs of this type in the various families, indicating parallel lines of descent from a form that presumably had neither, but may have possessed a wholly internal sense-organ,—which served as a stimulus to their forma-

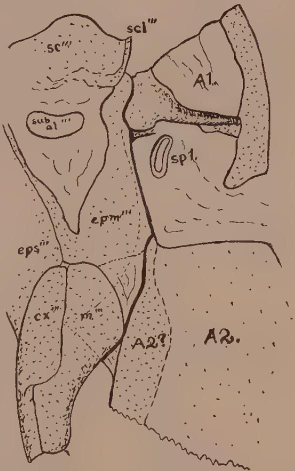

Fig. 1. Side view of metathorax and base of abdomen of *Apatelodes torrefacta* (Eupterotidæ), showing primitive macrolepidopterous arrangement of sclerities.

tion,—in connection with the first spiracle. The first type of tympanum is that more or less familiar in the Geometridæ, which is used by Prout (Genera Insectorum, fasc. 103) as the most fundamental distinguishing character of that family. This appears superficially as a simple hollow balloon located immediately below the spiracle, opening to the exterior in the fold that normally exists in the sclerite of the abdomen facing the hind coxa. It is usually more or less ellipsoidal, and opens conspicuously on the side, forward and outward. In many cases the two tympana are so large as to be separated from each other only by membrane, and look like a pinhole clear through the moth,—as is very conspicuous in Eudule and many Acidaliinæ (Sterrhidæ). In the Ennominæ the organ is smaller and less conspicuous externally, but entirely of the same character, and it exists even in the lower Œnochrominæ (Monocteniidæ). In this type the spiracle lies on the upper edge of the organ, and the dorsal part of the segment is normal.

Internally (Fig. 6) the structure is seen to be somewhat more complex. The tympanum itself may be compared roughly to a kettle-drum with edges curving inward strongly to meet the edge of the membranous area that represents the head, and faces forward. (It has been turned back in the figure to show the structures between it and the thorax.) Running almost across this head there is a tapering chitinous tongue, lying in the membrane, to the tip of which are attached a couple of muscles, the soft fleshy connection with the nerve (B), which histological study, is likely to prove the end-organ itself, and a variety of air-sacs and fine tracheæ. In fact the whole organ is enveloped in a system of air-sacs, which have mostly been removed in the specimen figured. The external opening of the apparatus is on the side that lies against the body-wall,—as if a large hole had been cut in the side of the kettle. The nerve-supply appears to be from the anterior segmental nerve of the first segment of the abdomen, which runs back from the ganglion, which is fused with the metathoracic one. This nerve runs past the tympanum anteriorly, and then over the spiracle and up to supply the dorsal musculature, etc. The part of it between the tympanum and spiracle is surrounded by large air-sacs, which connect directly with the spiracle.

The European genus *Cimelia* is generally placed in the Geomet-

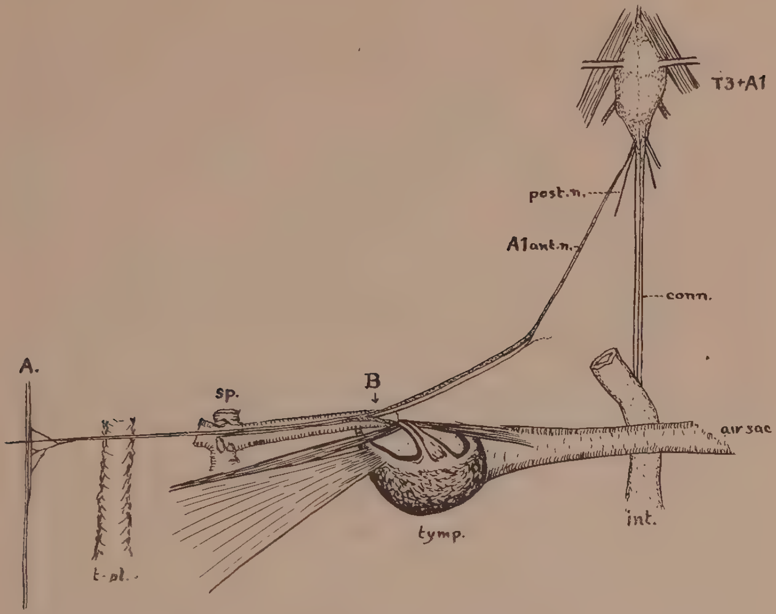

Fig. 6. Tympanum with its principal muscles and nerve connections, of the Geometridæ (drawn from *Biston ursaria* and *Phigalia titea*). Only two of the numerous air-sacs are indicated, the one lying ventrad of the nerve, and along which the nerve runs from the tympanum to the spiracle, and the large double one connecting the tympana. The latter appears ventral in the dissection, which was opened out on the middorsal line, but in fact lies above the digestive system. When the dissection is first opened it is normally filled with air and may be the most conspicuous object in the field.

ridæ, but appears to be omitted in Prout's consideration of the Œnochrominæ (Genera Insectorum, fasc. 104). A superficial study of the single dry specimen available shows that there is no true tympanum, either of Geometrid or any other type, but there is a slight thickened bar that may represent the bar across the drum-head of the tympanum, lying in the membrane of the ventral surface. There is no definite suggestion of Notodontid structure; and I believe that the genus represents a new family type, leading up to the Geometridæ from something intermediate between the Dioptidæ and Notodontidæ,—probably direct from the unknown Geometrid-Bombycid ancestral form. There seems to be nothing in venation or mouth-parts to contradict this reference.

For the normal, and primitive condition in the Lepidoptera (except the very lowest Tineoids and Jugatæ), we may take Apatelodes, a somewhat isolated genus of the Bombycid stem (Fig. 1). Here the metathorax is moderately developed, and there are no specializations which do not occur all the way from the Cossidæ to the Saturniidæ. The scutum and scutellum are normal, the cord connecting the scutellum with the inner margin of the wing is somewhat wavy, but forms no distinct lobe, the epimeron is V-shaped as in the mesothorax, and though too lightly chitinized to be quite sure of its boundaries shows no sculpturing except a slight articular surface where it meets the tergopleural line of the abdomen. The postscutellum is not sharply set off from it, and the entire structure is essentially as in the mesothorax. The first segment of the abdomen is, as usual in Lepidoptera and related insects, largely membranous; the tergum is a rectangle of membrane, enclosed in an anterior band which articulates subdorsally with the thorax, a posterior band, extended well down on the sides, but not reaching the ventral region, and a pair of heavily chitinized lateral grooves;—the latter seem to represent the tergopleural suture, so that the narrow edge of chitin below them should be considered the pleurite. The front end of this groove runs to a shallow pocket between thorax and abdomen. The lateral region is wholly membrane, containing a normal spiracle. Ventrally the first two segments are not distinguished, and are heavily chitinized only in front where they lie against, and are slightly grooved by, the posterior coxæ. The external modification to form the first or Geometrid tympanum is merely the enlargement of the coxal groove into an ample cavity, and the distortion of other structures to make room for it.

The second type of tympanum occurs in the Arctiidæ, Lymantriidæ, Syntomidæ, Pericopidæ, etc. (Fig. 2.) In this the thorax is undisturbed, though in the forms I have studied there is the usual lack of definiteness of the epimeron; the abdomen dor-

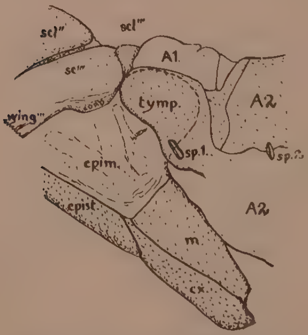

Fig. 2. Same view of *Hemerocampa leucostigma* (Liparidæ), showing second type of tympanum.

sally and ventrally is as before, but in the pleural region above the spiracle there has developed a bulla exactly like that of the Geometridae externally, but instantly distinguished from it by the fact the spiracle lies on its lower edge. A cursory examination suggests that it has developed out of the remaining rudiments of pleurites. The thorax shows more or less trace of the curious modification described for the Noctuidae, but the venter of the abdomen is typical.

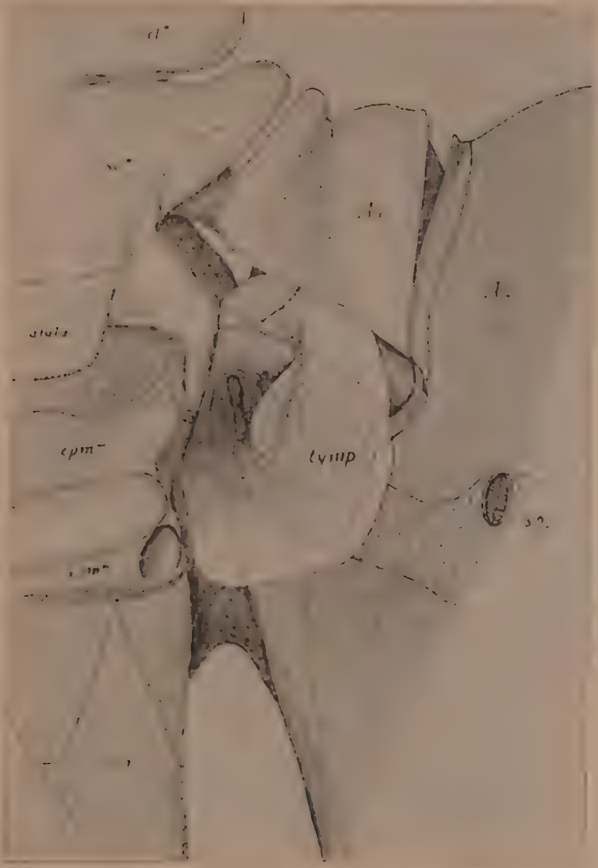

Fig. 3. Same view of *Catocala parta,* showing third, or usual Noctuid type of tympanum. The cover, or alula of the hind wing is drawn forward, and the posterior edge is turned back to expose the spiracle and structures within the tympanum.

The third, or Noctuid type, is perhaps the most interesting of all, being at once the most complex, and that occurring in the largest family. (Fig. 3.) Here there is no simple rounded bulla, either subdorsal or subventral, but the whole spiracular region is deeply excavated, the excavation including the posterior region of the thorax as well. This cavity in the more typical case is roofed over by the alula of the hind wing, which is largely developed, especially in such Quadrifidæ as Catocala and the Euteliinæ, and is enclosed behind by a large flap, developed behind the spiracle. It seems to be the same pleurite that has formed this and the bullæ of the Arctioids, but the development has been behind, not above the spiracle, and is of a wholly different character, as the figure shows. Another interesting development is a deep fovea in the parapleural region of the thorax, across which the suture between postscutellum and epimeron may sometimes be traced. In this series the epimeron, often heavily chitinized, tends strongly to break up, and to develop more complex sculpturing, as is notable in Catocala. Alypia and the Notodontidæ (Fig. 5) show interesting variants of this type. In the latter the lateral cavity is present, but slightly developed, and the alula is rudimentary, not covering it, the lateral flap behind the spiracle is also absent, though the material from which it forms is indicated as a chitinized area about the spiracle that already tends to overgrow the lateral groove. The parapleural fovea is well marked, however, and already undercuts a portion of the parapleura, which makes a stiff and solid connection with the abdomen (partly broken in the figure). This type could well represent the point of origin of the Noctuid one, but is wholly unlike the simple structure of Apatelodes. In Alypia (Fig. 4) we have a second rather simple modification. The parapleural fovea is well marked, but the region about the spiracle is reduced, without any spe-

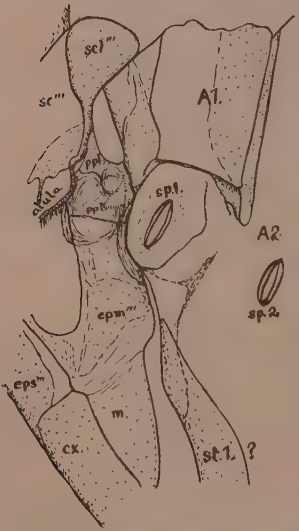

Fig. 5. Same view of *Datana ministra.*

cial sclerites, and in this case the hollow area which normally exists dorsally between thorax and abdomen is very much enlarged, extending back into the second segment, as a thin-walled balloon. In all variants of type three this fold seems much better developed than in the primitive condition.

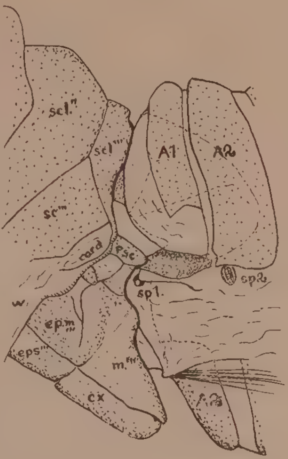

Fig. 4. Same view of *Alypia octomaculata* (Agaristidæ). The internal expansion of the fold between thorax and abdomen is indicated by the dotted lines. A strong suggestion of this structure occurs in some Noctuidæ.

As to the evolution of these forms I have little doubt that I am correct as to the primitive condition, since it occurs generally in both Micro- and Macrolepidoptera; from it I should derive type three (in its simpler Notodontid subtype) directly, and from that the more specialized subtypes and type two. Type one seems, however, independent. Working this out as a genealogy we will have a first dichotomy between the primitive condition (plus type one) and types two plus three. This corresponds (so far as I recall, exactly) with the division between upright and flat egg, and between the caterpillars with hooks in a single length and those alternately of two lengths, and in those two particulars would dispose of the anomalous position of the Notodontidæ (excluding Apatelodes). It would leave, however, the Notodontidæ as a solitary trifid family in a mass of Quadrifidæ, and would similarly maroon the Lasiocampidæ in a wilderness of trifidæ. Possibly the importance of the position of M^2 in the fore wing is less than it has been considered. Already we give little weight to it in the hind wing, and in certain Hydriomenid Geometridæ, such as Eudule.

FAMILIES EXAMINED.

Primitive type.

Microlepidoptera.
Cossidæ.
Eucleidæ, etc.
Eupterotidæ (Apatelodes).
Bombycidæ.
Saturniidæ.
Sphingidæ.
Lasiocampidæ.

Type 1 (subventral tympanum).

Geometridæ only.

Type 2 (subdorsal bulla).

Lymantriidæ.
Arctiidæ.
Nolidæ
Syntomidæ.
Pericopidæ.
Herminiini and Epizeuxis of the Noctuidæ.

Type 3 (parapleural fovea.)

Notodontidæ.
Noctuidæ.
Agaristidæ.

It should be noted that Brues and Melander, in their key to the families of Lepidoptera erroneously refer to this organ in the Pericopidæ and Geometridæ, as the spiracle; it is perfectly distinct from the spiracle, lying above it in the former, and below in the latter case. So far as I know the spiracle itself is always small and normal, and varies very little in position. It should be noted, however, that the "tympanic opening" of the Dioptidæ (Psyche, XXI, 59, alternative 32) is not homologous with that of the Geometridæ, but is the rudimentary structure noted in Apatelodes, and which becomes enlarged in the Agaristidæ. In the case of the Pericopidæ (alternative 48) the separation from the Arctiidæ is slender, while the majority of Noctuidæ of course completely lack the bulla. The key would really be cleared up by transferring Haploa to the Pericopidæ, where it would not be as wholly out of place as one might think. The Pericopidæ certainly belong here rather than in the neighborhood of the Notodontidæ or Bombycidæ.

Summary and Conclusions.

A study of the base of the abdomen in certain Lepidoptera suggests:

1. The Notodontidæ are better placed near the Noctuidæ than near the Geometridæ and Bombycidæ.

2. Apatelodes is not Notodontid, but may be Eupterotid, agreeing in general with the Bombycid series.

3. The Lymantriidæ, Arctiidæ, Nolidæ, Pericopidæ and Syntomidæ are undoubted close relatives, agreeing in a unique specialization.

4. The Noctuidæ, Agaristidæ and Notodontidæ are similarly

grouped, and no reason has developed to separate them widely from the preceding group.

5. The Bombycidæ, Lasiocampidæ, Saturniidæ, Sphingidæ, Apatelodes, and their relatives also form a distinct group, but as they are associated by the absence of specializations in the structures studied, they may be justly divided up on other characters.

6. The tympanic bulla of the Geometridæ is not homologous with that of the Arctiidæ, etc., being developed on the opposite side of the spiracle.

7. A new subfamily, *Cimeliinæ*, is needed for the genus *Cimelia*, based mainly on the following characters: Tympanum absent; Sc of hind wing not angulate at base, without a brace connecting it with the base of the frenulum, closely parallel to R to a point well beyond the end of the cell. Structure otherwise as in the lowest Geometridæ (Œnochrominæ).

SUPPLEMENTARY NOTE: Since writing this article, the Dioptidæ, Thyatiridæ, and Drepanidæ have been examined. The Dioptidæ show no tympanum of any kind and will make a first exception to the rule that uniordinal hooks on the prolegs are coördinated with a tympanum of Arctiid or Noctuid type. The egg is described as spherical, and so may be of either type. In the Thyatiridæ and Drepanidæ there is a new type of tympanum; the tergopleural suture is modified into a large cavity, *opening backward*, which lies beneath the spiracle, and there is a large double chitinized structure subventrally which does not open to the exterior unless it communicates with this tergopleural opening. The structure is so complex, and so similar in the two families as to make their association almost certain, especially as the larval and venational characters are rather similar.

EXPLANATION OF FIGURES.

A = Lower edge of subdorsal muscle with nerve-supply.
A^1, A^2 = First and second segments of abdomen.
A^1 ant. n. = Anterior nerve trunk of first segment of abdomen.
B = Supposed sensory end organ of tympanum.
conn. = Connective.
cx. = Coxa.
epm. = Epimeron (of metathorax).
eps. = Episternum (of metathorax).

int. = Portion of digestive system.
m. = Meron of hind leg.
post. n. = Posterior nerve trunk of first segment of abdomen.
ppl., psc. = Parapleura, or exposed lateral end of postscutellum.
sc″., sc‴. = Scuta of meso-, and metathorax.
scl″., scl‴. = Scutella of meso-, and metathorax.
sp^1., sp^2. = First and second abdominal spiracles.
subal. = Subalar sclerite of metathorax.
tymp. = Tympanum.

1. Side view of metathorax and base of abdomen of *Apatelodes torrefacta* (Eupterotidæ), showing primitive macrolepidopterous arrangement of sclerities.

2. Same view of *Hemerocampa leucostigma* (Liparidæ), showing second type of tympanum.

3. Same view of *Catocala parta*, showing third, or usual Noctuid type of tympanum. The cover, or alula of the hind wing is drawn forward, and the posterior edge is turned back to expose the spiracle and structures within the tympanum.

4. Same view of *Alypia octomaculata* (Agaristidæ). The internal expansion of the fold between thorax and abdomen is indicated by the dotted lines. A strong suggestion of this structure occurs in some Noctuidæ.

5. Same view of *Datana ministra*.

6. Tympanum with its principal muscles and nerve connections, of the Geometridæ (drawn from *Biston ursaria* and *Phigalia titea*). Only two of the numerous air-sacs are indicated, the one lying ventrad of the nerve, and along which the nerve runs from the tympanum to the spiracle, and the large double one connecting the tympana. The latter appears ventral in the dissection, which was opened out on the middorsal line, but in fact lies above the digestive system. When the dissection is first opened it is normally filled with air and may be the most conspicuous object in the field.

BOOK REVIEWS.

THE RHYNCHOPHORA OR WEEVILS OF NORTHEASTERN AMERICA. By W. S. Blatchley and C. W. Leng.

This important work is the first general treatment of any considerable portion of the Rhynchophora of North America for forty years and is even more comprehensive than that of LeConte and Horn for the chosen district. Its possession should remove from the collector of eastern North America any temptation to throw away or even neglect his captures of this suborder.

In this work of 682 pages the coleopterist will find efficient keys to the families, tribes, genera, and species known to occur east of the Mississippi River. Full descriptions of 1,084 species are given. It is illustrated by 155 very good figures, 21 of which, together with about 7 pages of text, are devoted to the explanation of the structures used in the classification. Four new genera, 74 new species and 5 new varieties, the majority of them from Indiana and Florida, are described by the pen of the senior author.

The general scheme of the "Coleoptera of Indiana" has been followed throughout the text, with the addition of seven pages of Bibliography and a 3-page index to the plants mentioned in the generous notes on distribution, occurrence and habits that follow the description of each species. The classification used is mainly that of LeConte and Horn, modified where necessary by the results of recent studies in the suborder.

The amount of work represented by this volume can better be appreciated after reading the Introduction. In all cases where possible the descriptions have been written from the actual specimens themselves and in connection with the original descriptions, while the senior author has visited the principal museums and many public and private collections in the East to compare doubtful specimens with the types. It is very evident that the authors have spared no efforts to present accurate determinations and careful descriptions, and the results of their labors should stimulate the study of this somewhat neglected group of beetles.

We hope that the coöperation by which the scope and usefulness of this work has been increased will not escape the appreciation of its students, for each author has sacrificed his partly completed work to this end. No such example of the subordination of self to the interests of science has been placed before the American Coleopterists since the days of LeConte and Horn.

C. A. Frost.

It is with great regret that we have to record the passing of Otto Heidemann, who died on November 17, 1916, at the age of seventy-three. For many years he has been in charge of the Hemiptera in the United States National Museum, faithfully performing the arduous routine duties of the position, and yet finding time to publish a considerable number of contributions to the literature of his specialty. More than this, he was always ready to share his great knowledge of the Hemiptera with all who sought his advice, and it can safely be said that a large part of the hemipterological work published in America since the days of Uhler has been based upon his store of information, avowedly or not. Thoroughness in his work, kindliness in his relations with others, and self effacement when his own interests were at stake went to make up a rare nature which can ill be spared.

Through the kindness of Mr. John Howard Paine we are enabled to present in this issue a very excellent and characteristic portrait of Mr. Heidemann.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. F. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinæ of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Transactions American Entomological Society, vol. 4. Also will purchase specimens of Catocola Sappho.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Old Series Entom., Bul. 1, 2, 3, 33; Technical Series 4, 6, 7; Insect Life, vol. 4–6; Jour. Applied Microscopy I, N. Y. State Entom. Rep. 3, 4; Fitch Rep. 7, 8, 13.—Philip Dowell, Port Richmond, N. Y.

Would appreciate receiving date, stage and mode of hibernation of insects of all orders. J. P. Baumberger, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Ill. Ent. Rpts. 2, 3, 5, 7. 9, 10, 11, 12, 13, 19; Hensham's List of the Coleoptera of America North of Mexico, 1895. For Exchange Bulletins and Circulars U. S. Bur. Ent.—J. S. Wade, Wellington, Kan.

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PSYCHE.

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